

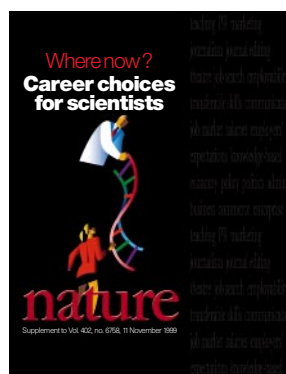
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The language of science



Cover illustration by Alex Barsky

Throughout its 130-year history, *Nature* has provided readers with news and comment about scientific careers. A glance at our website (www.nature.com) will show a collection of careers features covering a wide range of scientific disciplines — immunology, chemistry, cell biology, physics, cancer research and earth sciences, to name but a few. For the ambitious practitioner of any of these subjects, this *Nature* collection provides a repository of invaluable websites and other data essential for the serious jobhunter who wants just the right opportunity.

No scientist working today could fail to be aware of the anguished debate about the poor career structure and lack of basic opportunities in academic research. *Nature's* current debate on the situation of women in scientific careers (<http://helix.nature.com/debates/women>), which has attracted a huge number of contributions, provides but one example. Yet a knowledge of science provides the individual with skills far more wide-ranging than that of the practice of scientific research itself. Increasingly, science is a language, familiarity with which can enhance one's prospects in a host of non-scientific professions.

This supplement, on 'career choices for scientists', provides *Nature's* UK readers with a review of some of these opportunities. Whether at the undergraduate level or at the level of a government minister, there are numerous opportunities for those who speak science's language but who do not wish to continue in, or who wish to switch from, a career in scientific research. Many of these jobs provide far more long-term security, cover a broader span of subjects and certainly can pay better than positions at the lab bench or department's computer terminal. We hope that you will find this supplement sparks your interest in a profession which you may not previously have considered, but for which you may be eminently well qualified.

Whether you are using your scientific skills in research or as a language in another profession, we trust that *Nature* will be both helpful and insightful, not just in providing perspective for your future job plans, but also in keeping you in touch with the world of science.

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Career choices for scientists: an introduction

There are many opportunities open to someone with a training in science. But to get that vital interview or become successful at one's chosen career, prospective employees must ensure they acquire the skills that employers seek.

Helen Gavaghan

"The name of the game is to enhance employability," says Carl Gileard, chief executive officer of the Association of Graduate Recruiters. His words apply equally whether your science qualifications be a BSc, a PhD or a postdoc. To be useful, then, a supplement on alternative careers (that is, not in academic institutions) for people with a background in science needs to give a sense of what makes someone employable.

While researching this supplement to *Nature*, what emerged strongly was the importance employers attach to the so-called 'soft skills' such as decision-making, team work and communication. Business skills, political awareness, self-awareness, assertiveness and confidence also rate highly on an employer's wish list.

With this in mind this supplement has several aims. First, to give a sense of the spirit of the time, the political and economic zeitgeist, so to speak, of the world into which job seekers are stepping. Second, to give information about the areas where people with a science education are finding work. And third, to show the backgrounds, attributes and attitudes of successful people from the world of science.

The opening article explores science policy, not only because this is a challenging job opportunity, but also because policy formation provides a sense of the themes running throughout the job market.

Next follows the findings from a survey of large employers by the Association of Graduate Recruiters. The survey describes the skills that these firms seek, where they anticipate vacancies and the salaries they pay. It is the world as seen from the employers' perspective. Although it deals mainly with undergraduates, postgraduates and postdocs may find the background information useful.

Postgraduates and postdocs will see more direct relevance in the article on page A8 about the introduction of science enterprise centres. These centres are a clear indication of the significance that both government and industry apply to the

acquisition of wider business and commercial skills during postgraduate and postdoctoral work.

Increasingly, postdocs are coming to the fore in policy discussions as the research councils and professional institutions grapple with the issues of concern to this highly trained but badly paid group of people. One difficulty that policy-makers encounter is the lack of quantitative information about how postdocs earn their living. A survey commissioned by the Institute of Physics plugs that gap to some extent for the physics community, and its findings are reported on page A9.

For many, life in science publishing and journalism is, judging by letters and queries to *Nature's* staff, an area of activity about which there is much curiosity. On page A11, *Nature* opens its doors to give an idea of life on a science journal.

On pages A13 and A14, articles about Stephanie Pain, *New Scientist's* associate editor, and Christine McGourty, the BBC's science and technology correspondent, give a flavour of the journalist's life on a consumer magazine title and in television and radio.

And, finally, a story about the Floating Point Science Theatre shows the breadth of choice available to someone with a training in science. ■

Useful careers resources on the web

Nature's Careers and Recruitment features provide invaluable information about scientific careers in a huge range of disciplines. All of these features can be accessed online at <http://www.nature.com/classified/reviews.html>.

Jobs advertised in *Nature* can be searched online — for example by subject, location, organization or position — at the following location <http://www.nature.com/jobs>.

In addition, the following websites are a good place to start job searching. It is also worth checking the learned societies and professional organizations for specific disciplines.

The Guardian <http://www.jobsunlimited.com>

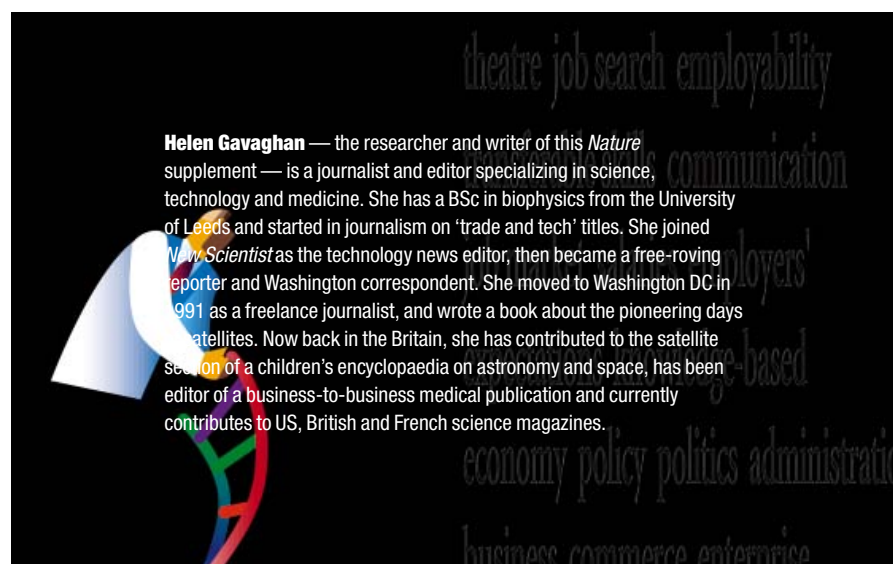
BioMedNet <http://www.biomednet.com/jobs>

CareerPath.com <http://www.careerpath.com>

National Postgraduate Committee
<http://www.npc.org.uk>

Wellcome Trust <http://www.wellcome.ac.uk>

Times Higher Education Supplement
<http://www.jobs.thes.co.uk>



Helen Gavaghan — the researcher and writer of this *Nature* supplement — is a journalist and editor specializing in science, technology and medicine. She has a BSc in biophysics from the University of Leeds and started in journalism on 'trade and tech' titles. She joined *New Scientist* as the technology news editor, then became a free-roving reporter and Washington correspondent. She moved to Washington DC in 1991 as a freelance journalist, and wrote a book about the pioneering days of satellites. Now back in Britain, she has contributed to the satellite section of a children's encyclopaedia on astronomy and space, has been editor of a business-to-business medical publication and currently contributes to US, British and French science magazines.

Complexity in science policy

For those interested in what makes the world of science and technology tick, and in its links with business and wealth creation, there are intellectually challenging jobs to be had in science policy and administration.

Knowledge-driven economy, sustainable development, the post-genomic age — such phrases trip glibly from ministerial lips and can seem vague and uninspiring. But that view would be a mistake, as these are the phrases that reveal the philosophy guiding how the billions — roughly £6.5 billion in 1998/99 across all government departments and agencies — of our money are spent on science, engineering and technology each year. And they are the words describing today's world of employment.

Between political philosophy and its reification in grant allocation, research programme or government initiative there is a long and complex process during which the principles of UK science policy are set out by officials and administrators at the Office of Science and Technology (OST) in the Department of Trade and Industry (DTI), by the research councils and by other government departments. At institutions such as the European Commission, yet more officials develop European-wide policies that reflect the political aims of elected governments.

These are the people who grease the wheels of active research. They might be



The might of democracy: but parliamentary decisions are made only after much detailed policy work.

scientific administrators dealing with the nuts and bolts of peer review, policy-makers deciding on research council strategies or negotiating Britain's position in international research programmes, or civil servants providing input to briefings for ministers on

subjects ranging from radioactive waste disposal to genetically modified organisms.

The route to policy-making

Although many officials developing science policy have an education in science at least

A tale of two policy-makers. 1. From a research council...

"I wasn't disillusioned with research," says **David Lynn**, director of planning and communication at the Natural Environment Research Council (NERC). **"But I couldn't see what the wider benefits were of my work."** Although the mechanism of involvement is different, he now finds the world of science policy keeps him in contact with science and gives him the broad picture he craved.

For his PhD Lynn focused on remote sensing, often called Earth observation, using NERC's aircraft. His first contact with those he calls the "men in the grey suits" came when he presented data he had collected aboard NERC's aircraft to the research council's staff. (Many of Lynn's senior staff are women so the grey suits are no longer worn by men alone.) After completing his PhD Lynn applied for a

job in science administration at NERC, developing remote-sensing projects.

"For the first year or so I missed active research," he says, **"but I'm glad I made the choice I did."**

After three and a half years with NERC, Lynn was offered a secondment that enabled him to switch from science administration to policy-making. **"I see policy work as data gathering, analysis and direction setting, whereas science administration is more handle turning of the process of grant applications and peer review."**

Lynn returned to NERC two and a half years later and worked on charging and access policy for NERC's huge national data archives. There followed some time in the corporate affairs unit, where he became increasingly interested in the European

and political dimensions of policy development owing to involvement with the European Union and Parliament. The liaison involved explaining how NERC-funded science contributed to significant public issues, such as decommissioning offshore structures or radioactive waste disposal. The information might be presented to a parliamentary select committee inquiry or as a government answer to a parliamentary question.

Then six years ago Lynn took up another secondment, this time at the science and technology secretariat of the Cabinet Office. **"That was a tremendous experience at the heart of government,"** says Lynn. **"I saw how scientific advice is applied across Whitehall... Information is needed quickly on live issues."**

Now back at the NERC as director

of planning and communication, Lynn's responsibilities include liaising with parliamentary select committees and responding to parliamentary questions through the Office of Science and Technology, strategic planning, and monitoring and evaluating the impact of NERC-funded science. The last of these responsibilities, says Lynn, is "an enormous exercise", which gives feedback to government about how effectively public money is being spent.

It is not essential to have a science background for science policy work, says Lynn, but it can be very useful. When he is recruiting he looks for an ability to synthesize large amounts of information. **Analytic ability, a questioning approach and communication are also important,** he says.

to bachelor level, others do not. Others may be eminent scientists or full professors who have switched to policy-making late in their careers. Take David Southwood who was head of the physics and astronomy department of Imperial College, London, and is now responsible for formulation of the European Space Agency's Earth-observation policy. Southwood headed efforts to develop a case that in June this year convinced ministers from the 15 member states of the agency to set aside 600 million euros (a little under £400 million) for monitoring Earth's resources from space.

Southwood's interest in policy started 20 years ago when he needed money for his own expensive space-based research. Working in such a pricey field drove home the message that you need to convince government and policy-makers that their money should be spent on your project and that your own research cannot be seen in isolation.

To the aspiring science policy expert or administrator, whether as a career civil servant or as someone working at a research council, curiosity about the machinery of government is essential. The process is both top down, from the executive — the government — and bottom up, from bodies such as the research councils and universities who spend the money. Both at the political level — from prime minister, chancellor and secretaries of state — and in the supporting public service sectors, the task of developing policy is multilayered, iterative and distinctly nonlinear. To coin a scientific analogy, policies are the emergent property of a seemingly chaotic system.

For a rudimentary sense of the complex-

ities of the UK science, engineering and technology (SET) base it is worth studying the SET statistics published annually by the OST. The trends and spending patterns give information about where researchers are needed in industry and the public sector.

The main set of statistics is a rough breakdown of the government's SET spend, which amounted to £6.8 billion in 1998/99. Government decided what this spend should be during its comprehensive spending review (CSR), published in 1998. The CSR took two years to prepare and it is a blueprint for the spending during the final three years of the government's term in office. It is the vehicle that carries government policy into every area of public expenditure.

The science budget

As an illustration of how the worlds of officialdom and politics come together to determine allocation of public funds, take one strand of the SET spend — the science budget. This is the money that the research councils and the Royal Society spend, which in turn is divided between individual scientists and research groups. In the CSR, the science budget received an increase of £1.1 billion (15 per cent in real terms) over three years, taking it to £1.66 billion annually by 2002. People at every level hold information that contributes to the decisions about how to split the money. At the sharp end of science, in the universities and research councils, trends in research emerge. When assessing grant applications, scientists and administrators spot at an early stage something such as, for example, the transition from gene hunting to research establishing gene function. Such

information feeds upwards through the research councils and outwards to the OST and other government departments, being synthesized with information from other disciplines by officials with ever wider briefs.

Knowledge-driven economy

At the other end of the scale, where the executive has the responsibility for planning for the country's future economic well being, politicians aspire to seeing the much vaunted "big picture". Hence the prime minister will give a speech pointing out that Britain no longer has an empire, has few national resources and that its future depends on the knowledge and creativity of individuals — the so-called knowledge-driven economy. Recognition of the significance of the knowledge-driven economy then feeds into government policy, and the choices made in the CSR, from industrial and economic policy to science policy.

Take, for example, the decision to increase the budget of the Biotechnology and Biological Sciences Research Council. "This was really saying that biological sciences are going to be extremely important in the next century, in terms of underpinning both science and industries of the future...part of the CSR was an extra allocation for exploiting genome valley," says Lord Sainsbury, the science minister, in an interview with *Nature*. Sainsbury, who was responsible for allocating the science budget, says that "we have an outstanding science base and we see this as being an important national asset in terms of the knowledge-driven economy". Hence the additional £1.1 billion for science.

What does a phrase that can attract such large amounts of money mean? "To me it is a description of what is happening in the economy," says Sainsbury. "At its simplest, knowledge-driven means that the physical content of products and services in the new industries is becoming less and less. Added value, attributed through intellectual processes, is becoming greater and greater. Take Microsoft, it has virtually no physical assets, but it has a huge capitalization based on its knowledge."

There are, argues Sainsbury, numerous examples of where the knowledge derived from the science and engineering base are adding value to products. "It is the ability to manage the knowledge that creates these products and services which gives a competitive advantage, rather than managing physical engineering," says Sainsbury.

Filtering of advice

How and where do the policies and the world of active research funded by the research councils fit into these wider issues? The two come together when the science minister sits down with John Taylor, the director general of the research councils, to apportion the science budget. Taylor will

... 2. From the Office of Science and Technology

The European Union's Framework programme of research is funded jointly by all member states. It is intended to promote cross-border collaboration and links between industry and academic institutions. The idea is that this research should be in areas that cannot be undertaken by one nation alone.

David Coates from the transdepartmental science and technology group of the Office of Science and Technology (OST) is one of the officials who spend their time thinking about and negotiating Britain's position in the Framework programmes. His area of responsibility, which involves both project management and policy-making, is biotechnology.

Currently, Coates is managing the wind up of the fourth Framework programme (FP4), which ran until 1998, and the early calls for proposals in the fifth Framework programme (FP5), which will run from 1999 to 2002. It will cost European taxpayers a little over £10 billion. At the same time, he is preparing for negotiations on FP6, the follow-on research programme to FP5. He is setting up the mechanisms for initial consultations with, among others, industry, unions, government departments and the committee of vice chancellors and principles. These consultations will inform the UK policy position for FP6.

Coates says his job depends on an awareness of the political

environment, as well as on presentation, communication and negotiating skills and an ability to synthesize large amounts of data from different sources.

After completing a PhD in microbiology, Coates joined the commercial side of the chemical industry and studied for an MBA. He learned negotiation and presentation from the commercial world, then joined NERC and was exposed to policy, and was then seconded to the OST. Of science policy jobs in general, Coates says that **"if you are not comfortable with short deadlines and manipulating lots of information from lots of sources then you will struggle"**.

have listened to the priorities expressed by the chief executive officers of the research councils who, in turn, are briefed by their staffs. Both science minister and director general have access to the findings of the science and engineering base group of the OST.

As back up during this process, the science minister can draw on the policy summaries and briefing papers of the DTI's civil servants. The minister is also advised by the chief scientific adviser who has an office in both the DTI and the Cabinet Office and who is responsible directly to the prime minister. From his post in the Cabinet Office, the chief scientific advisor has a view of the science efforts across Whitehall. Both chief scientific advisor and science minister are supported by the transdepartmental science and technology group of the OST.

It is through this mesh of policy groups that the advice filters that leads to an allocation of funding among the research councils. "Dividing the science budget was a difficult decision," says Sainsbury. Once the alloca-

tions are made, the research councils decide internally how to spend the money, but broad strategies laid down at the time of the funding allocation guide the decisions.

So much for the science budget. Science policy is also important for industry. The location of the science minister's office within the DTI reflects an article of faith both for this and the previous government that Britain's economic success rests on there being more commercial exploitation of the science base and closer links with industry.

The complex and iterative process of deciding the science budget applies at all levels in each of the elements of the UK's SET spend, including that spent to support the UK's participation in the European Union's fifth Framework programme. Preparations are now underway across government for the next CSR, which will be the Labour Party's blueprint for government spending from 2002 should it be re-elected. In short, there is plenty of work for science, engineering and technology policy-makers. ■

Job search

For further information about how to join the civil service fast stream, check: <http://www.rasnet.co.uk/RAS/capitaras.html>.

The Office of Science and Technology (OST)'s transdepartmental science and technology group, which is headed by Jo Durning, is considering making formal arrangements for taking secondees from universities, although she says that "this is currently only an idea". Further information on science policy can be found at <http://www.hmtreasury.gov.uk/pub/html/csr/401101.htm> and <http://www.dti.gov.uk/ost>.

For general jobs in science policy, check the classified adverts of *Nature* and newspapers such as *The Guardian* (website addresses on listed on p. A3).

The OST's SET statistics are published by The Stationery Office and can be accessed online at <http://www.dti.gov.uk/ost/SETstats98>.

A view from the employers' side of the fence

Results from a recent survey of large employers indicate the growth areas of employment and the level of competition that applicants should expect to face. The findings also highlight the skills that employers are seeking.

A graduate's most important skills, say employers, are interpersonal skills, motivation and enthusiasm, and team working ability — in that order. The skills most often lacking but desirable, they say, are leadership ability and business awareness.

These findings emerge in a survey of large employers, like Logica and AstraZeneca, which are members of the Association of Graduate Recruiters (AGR). The strongest anticipated growth areas for employment are the public sector (19.4 per cent), areas of manufacturing (19 per cent), business services including finance and accountancy (18.5 per cent), and electrical and electronic engineering (13 per cent). The median predicted starting salary for undergraduates in 1999 was £17,400.

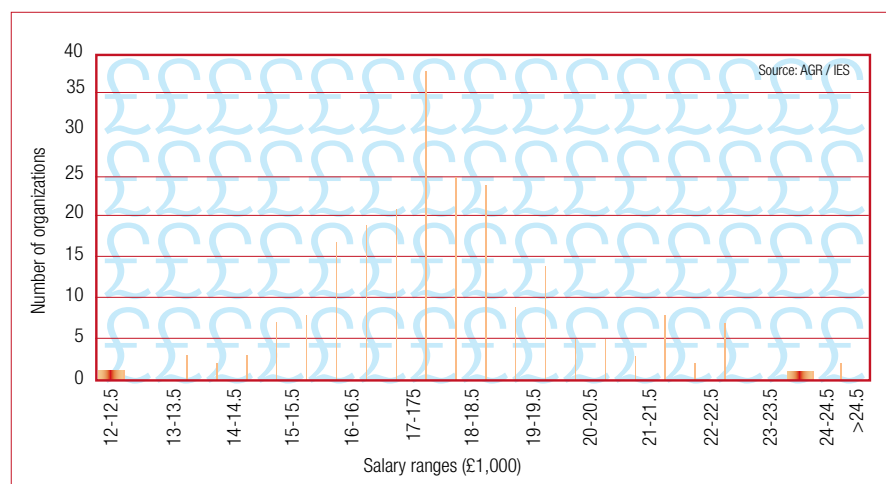
AGR is a professional association with a membership of about 600 mainly large company and public sector employers. Twice yearly, the Institute of Employment Studies undertakes a salaries and vacancies survey for the association. Some 263 firms participated in the last survey and 23 of these were interviewed to explore specific issues in

depth in a qualitative fashion.

Competition for jobs

The survey shows that applicants face tough competition for jobs. On average, 67.9 people applied per vacancy, 14.8 people

were short listed per job and 8.4 were interviewed. Although these may be daunting numbers for applicants, they imply a seemingly healthy state of affairs from the employers' perspective. Nevertheless, some vacancies remained unfilled from 1998 and



Forecast of graduate starting salaries for 1999.

Marketing and public relations

Aspiring public relations (PR) and marketing executives need to know that people with a science background are often viewed as too narrowly focused. **"Personally, I would think a science background is not the natural place to look for someone for a marketing or PR job,"** says Mike Scowlam, the marketing manager for Bradford Metropolitan District Council. Yet at an undergraduate level, marketing — which includes PR, sales and advertising — is a popular career choice, according to a survey by the Association of Graduate Recruiters.

So science graduates who are interested in a career in PR or marketing need to make a lot of effort to prepare an attractive CV. **"Offering**

your services as an intern to your university's PR department is a good idea, says Sue Coffey, former head of public relations at the University of Bradford. When planning her PR strategy, Coffey had to consider ways to raise the university's profile both nationally and locally. She needed to know her audience and to imagine how visitors to the campus might feel. Universities can daunt people, she says, so besides developing a media strategy, she had to address small details such as whether the university's signposting was easy to follow.

For both good public relations and marketing, it is essential to have a keen awareness of the political and economic factors influencing your

organization. So be sure to know these if you get an interview.

"Marketing and PR is not for the heavily introverted," says Scowlam. **"You need to be able to walk into a room full of strangers and begin talking to them."** Scowlam would take a lot of convincing that someone with a science background could do this. **"Scientists can have a lack of understanding that the world operates in soundbites. I'm not saying that it is right that it should, but it does,"** he says.

Given that marketing is about stimulating and fulfilling demand, convincing someone to employ you will be your first successful marketing exercise.



For more information about marketing and PR, see the websites of the Chartered Institute of Marketing (<http://www.cim.co.uk>) and Institute of Public Relations (<http://www.ipr.org.uk>). Both organizations offer a variety of courses.

about a quarter of organizations expected vacancies to remain unfilled. "Employers won't take risks," says Carl Gilleard, the AGR's chief executive officer. "The investment is too high."

Interestingly, about a fifth of industrial organizations reported difficulties in recruiting to positions in science and research and development. Some 9 per cent of organizations reported major difficulties in recruiting the right candidate for jobs in electrical and electronic engineering, computer science and information technology,

perhaps because high flyers are snapped up quickly into lucrative jobs.

By contrast, scarcely any companies reported difficulties recruiting to jobs in finance, accountancy and investment.

With median starting salaries of £20,617 in banking and finance compared with £17,000 in engineering, it doesn't take a mathematician to make some connections. Admittedly, the median starting salary for accountants is only £15,500, but this tends to rise with experience. Median starting salary for jobs in public services was £15,691.

Gilleard. Yet most graduates will have had experience of some part-time work. "There are very few jobs where team work is not important." It is, argues Gilleard, important to be aware of all the skills you have acquired. "You need to know what it is you have to sell...It's a switch off if you put yourself down."

Three most important skills for graduate recruiters

Skill	No. of mentions	Percentage of organizations
Team working	96	39.8
Interpersonal skills	92	38.2
Motivation & enthusiasm	88	36.5
Flexibility	70	29.0
Customer orientation	56	23.2
Business awareness	53	22.0
Initiative and proactivity	47	19.5
Problem solving	44	18.3
Planning & organization	26	10.8
Numeracy	24	10.0
Managing own development	23	9.5
Leadership	22	9.1
IT/computer literacy	21	8.7
Oral communication	20	8.3
Written communication	12	5.0
Risk taking & entrepreneurship	6	2.5
Foreign languages	5	2.1
Time management	5	2.1
Other	11	4.6

A total of 241 organizations were asked to identify the three most important skills that they look for as graduate recruiters. The table presents the number of times each skill/attribute was mentioned (N = 721) and the percentage of organizations mentioning each skill/attribute. Source: AGR.

Searching the Internet

How can one find lucrative banking, finance or accountancy jobs? The 'Milk Round' at the end of an undergraduate degree course is one route, but employers do not target all universities so be prepared to search the Internet sites of banks or accountancy firms. The AGR's survey shows that 156 of those employers surveyed use the Internet to describe typical vacancies in their organization and 113 advertised specific jobs. Firms plan to use the Internet increasingly for recruitment and to download completed application forms.

When you find the job, then you need the skills (see Table). Interpersonal skills and team work were rated by recruiters as highly desirable. One employer defined team work as the ability to work to a common goal, share responsibility and use individual strengths. Another said that interpersonal skills are the ability to communicate maturely and professionally with people at all levels of management and without giving offence.

"Often the graduate lacks confidence and the ability to demonstrate those skills or they undervalue the skills they have," says

Job search

Explore <http://legacy.unl.ac.uk> posted by the University of North London. The university has drawn on findings from sources such as the Association of Graduate Recruiters (AGR) and the 1995 Competitiveness White Paper to give visitors a sense of today's business world and the increasing emphasis on small businesses as employers. There is information about skills that are desirable for successful job applications and a student action plan for making yourself more employable.

The website at <http://www.wdgd.csu.ac.uk> is the start of a cascade that takes you to the Association of Graduate Careers Advisory Services (<http://agcas.csu.ac.uk>) and the AGR (<http://agr.csu.man.ac.uk>). Also see the website of the Institute of Employment Studies at <http://www.employment-studies.co.uk>. There are too many company websites to give here, but they are easy to find with any standard search engine. If you don't know all the companies in a particular sector, take a look at the share price listings for the main players.

For articles and websites on alternative careers in law, patenting, banking, IT and journalism, see the *Nature* Careers and Recruitment feature 'Investigating the alternatives', available online at <http://www.nature.com/jobs> or in *Nature* 393, 493–498 (4 June 1998).

Universities, business and transferable skills

Government and the research councils have placed increasing emphasis on the need for postgraduate students and postdocs to receive training in business and commercial skills. But evidence of such training is patchy.

Like the shotgun persuading a reluctant bridegroom to the altar, the policy of successive governments has forced universities into the arms of industry and commerce. Money to finance the most recent initiative, the formation of centres of excellence for teaching business skills and the

commercialization of research, was released this autumn.

The government sees the centres as important for instilling the right educational background into scientists and engineers who are intent on starting their own companies or keen to join large firms. "I don't think

you can teach people to be entrepreneurs," says Lord Sainsbury, the science minister, "but you certainly can teach them about basic things they need to know like intellectual property or venture capital."

The centres, for which government has set aside £25 million, are located at universities experienced in forming start-ups and in the commercial exploitation of research. They are seen as part of the foundation supporting — and here is the phrase that is flavour of the year — the knowledge-based economy.

Scientists in business

"It's great fun going into a company and working out what you can sell," says Andy Brass, reader in the school of biological sciences at the University of Manchester and founder of Bioinformatics Solutions. He sees no conflict with his academic role. **"You're talking to some of the best scientists in biotech, who've published the top papers."**

Brass's conversion to entrepreneurialism came during a whistle-stop tour of genomic start-up companies in the United States. When he returned to Britain, he hi-jacked one of his masters students, one of his PhDs and a postdoc, visited the Manchester biotech incubator, and within months Bioinformatics Solutions was operating. The company is now seeking a professional chief executive officer.

Bioinformatics Solutions sells computational skills to companies with massive databases of potentially lucrative biological information. The company has three staff, in addition to Brass. The company secretary, Patricia Baker, was working as a postdoc with him before he lured her from academic research. **"It might be madness, but with no experience I got a chance to run a start-up company,"** she says. Her job includes cold

calling to drum up business, presentations to clients, building databases and doing technical work. Baker finds her work richly rewarding. **"You do what you have to do, but I don't imagine going back to basic research."**

The other two people Brass poached are Isobel Anderson and Mark Zaretti. Anderson's first degree is in molecular biology and she did an industrial placement at Glaxo Wellcome. Now she spends about 30 per cent of her time setting up databases. The other 70 per cent is split between technical work she does for clients, report writing and client liaison. She finds the work she is doing at

Bioinformatics Solutions satisfying and says she has no wish to spend her time writing postdoc grant proposals. Zaretti has a first degree in biology and a masters in bioinformatics. When Brass approached him to join the company, Zaretti quickly decided that the risk, which was higher than if he had joined a big pharmaceutical company, was worth the potential gain. Given the skills shortage in bioinformatics, Zaretti saw no bonus in studying for a further three years. **"It's a fast moving field, very competitive and there's a tight window of opportunity [to successfully establish Bioinformatics Solutions]."**



Baker and Zaretti realize the potential gains of joining Bioinformatics Solutions.

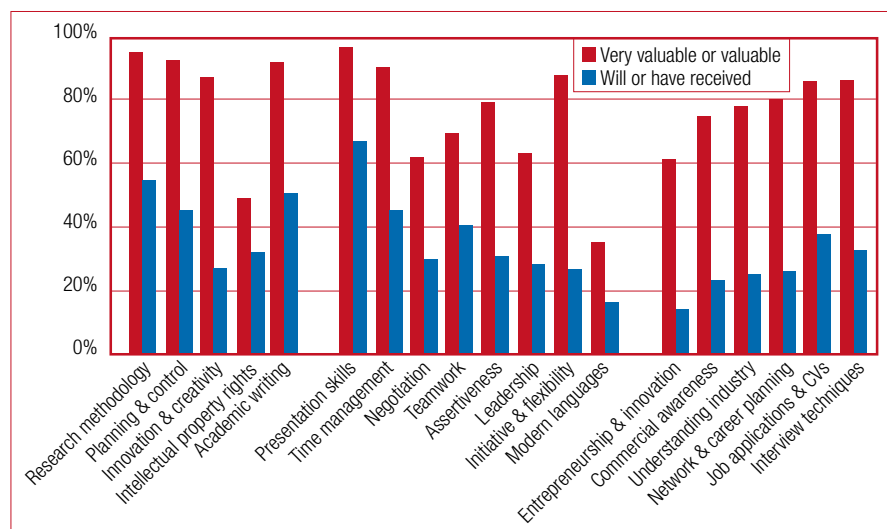
Commercial awareness

Not all universities will have a science enterprise centre, but all are encouraged to teach the so-called transferable skills needed for life outside academic institutions as part of research masters (MRes) and PhD courses. The MRes courses, introduced as a pilot scheme in 1994 to equip undergraduates either for PhDs or for jobs in industry, are "the most heavily audited [by the research councils] in universities," says Richard Balment, the University of Manchester's director of graduate studies for biological science. Part of the audit evaluates the courses' effectiveness in training people in commercial awareness as well as in research.

Although the transferable skills element of an MRes is closely monitored for consistency, the record of inclusion of this training for PhDs is patchy. One way of assessing in advance whether your doctoral studies will offer a commercial dimension — should that interest you — might be to check whether your chosen university has a science enterprise centre.

Figures in a survey by the Engineering and Physical Sciences Research Council are revealing because they show a mismatch between what PhD students think would help them and the training they expect to receive (see Figure on p. A9). Only when it came to research methodology and presentation did more than 50 per cent of PhD students in the survey say they would receive training. In all other skills, fewer than 50 per cent expected any training, and less than 20 per cent reported they would be trained in entrepreneurship and innovation.

Yet such skills are essential, especially



The value attached to different types of training by PhD students and their expectation of receiving that training at their university. (Source: EPSRC.)

Enhancing employability

Besides the need to learn research skills and business savvy, there is recognition that postgraduates need training in communication, team work, negotiating, decision-making and listening skills. These are what recruiters call 'soft skills', and employers rate them highly. The research councils' graduate schools programme offers five-day residential courses in just these skills, led by managers from industry and commerce. Janet Metcalfe, who coordinates the programme, says that **"PhDs undervalue themselves. Often the PhD students who come on the course are really surprised they can do anything other than research."** Details of the programme can be found at <http://www.epsrc.ac.uk/bmk/gsp>.

given the supply and demand of academic jobs. "Training in methods of research should produce individuals capable of a variety of jobs. If a PhD fails in that, then it is wrong," says David Southwood, former head of the physics and astronomy department of Imperial College, London.

Protecting intellectual property

"Students need an awareness of the significance of patenting and protecting intellectual property," says Andy Brass, a reader in the school of biological sciences at the University of Manchester. Brass master-minded Manchester's MSc in bioinformatics and has himself turned entrepreneur, founding the company Bioinformatics Solutions (see Box on p. A8). Brass argues that students need to know how to keep lab notebooks to support a claim. In the United States, patents are awarded to the first to invent, so each page of a lab notebook needs to be countersigned every day. "You do this in an industrial lab, so you may as well learn the discipline during a PhD," says Brass. "It's

worth doing because if an idea is not protected by a patent, no one is going to invest in developing a product."

If skills training is offered on a patchy basis for PhD students, the situation is even more acute for postdocs. Yet this group faces serious dilemmas of short-term contracts, low pay and lack of career prospects in academic institutions.

Recognizing the unfairness of this position, the research councils, Royal Society, British Academy and the committee of vice chancellors and vice principals agreed in September 1995 to work for improved pay,

conditions and training for postdocs. "We are making some progress, but it's patchy," says Bob Price, head of human resources and development at the Biotechnology and Biological Sciences Research Council. Price attributes this to postdocs wanting to do academic research and not necessarily seeing the value of transferable skills, and to universities wanting to keep costs down. Given these circumstances, Brass argues that after one postdoc you should think seriously about what to do next: "If after one postdoc your position is not strong enough to get a fellowship, then re-evaluate." ■

Where do all the postdocs go?

A survey of contract research staff by the Institute of Physics presents employment statistics of physics postdocs and has uncovered disturbing news about the need for wider skills training of postdocs in universities.

There is, say physicists in industry, a mismatch between the skills needed in the private sector, including research, and those acquired while employed as a postdoc. Furthermore, although higher education institutions remain the main employers of physics postdocs, only a quarter of those surveyed could cite good examples of training and development in their universities.

The finding emerged in a study commissioned by the Institute of Physics (IoP) to find out what physicists do for a living and what are their aspirations and experiences. Published this summer, the survey results were based on responses from 448 people who started their first postdoc between 1988 and 1993. The survey team also questioned a group of 236 people who began their PhD between 1994 and 1995. All had experience

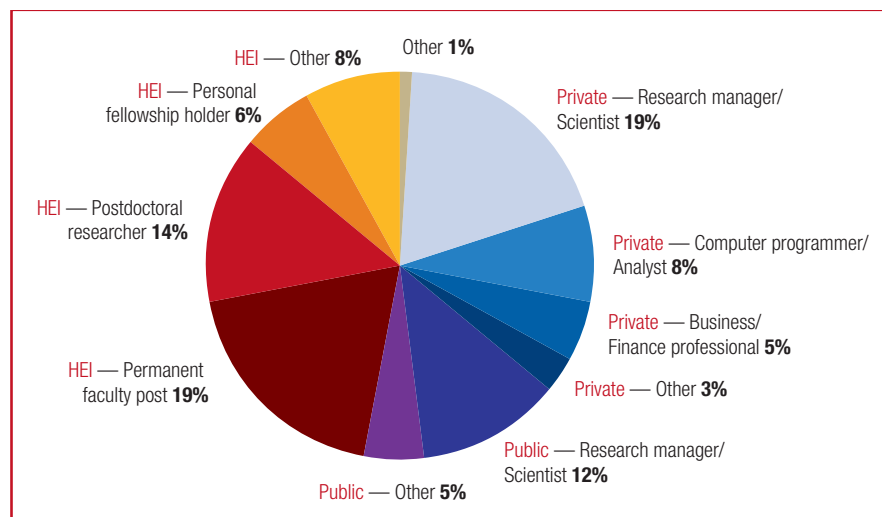
Further reading

The following *Nature* Careers and Recruitment features provide valuable additional information about scientists in business. In addition to appearing in the printed journal, all are available online at <http://www.nature.com/jobs>.

Out of the lab and into the marketplace — a feature on start-up companies and venture-capital financing (*Nature* 399, 175–182; 13 May 1999).

Taking knowledge from bench to bank — a feature on industry–university collaborations (*Nature* 395, 409–414; 24 September 1998).

Bioinformatics in a post-genomics age — a feature on bioinformatics (*Nature* 389, 417–422; 25 September 1997).



Employment destinations of physics postdocs. (Source: IoP)

of one or two contract research posts.

Just over a third of postdocs have jobs in the private sector. The public sector employs 17 per cent of physicists and a mere 2 per cent have jobs teaching in schools and colleges. Higher education institutions employ the remaining and largest group of physicists. High-tech, leading-edge manufacturers, business/financial firms and software/computing companies are the main private sector employers.

To succeed in these jobs, physicists listed the five most important skills they needed. These were, in descending order, project planning and management; presentation and communication skills; leadership skills; problem-solving skills; and individual initiative and self-motivation. By contrast, the five principal lessons they had learned as contract researchers were subject-specific knowledge; presentation and communication skills; technical research skills; individual initiative and self-motivation; and problem-solving skills. This mismatch is important given that only one in five postdocs will become permanent faculty members. More information about getting a permanent faculty post was one of the issues that postdocs considered

important. They also said that the research councils should allocate money for training and development.

Of those currently employed by the private sector, only 50 per cent would do a postdoc again. In the public sector and higher education, however, nearly all physicists would, if they had the decisions to make again, pursue postdoc experience. When questioned about whether they would consider teaching in schools as a profession, three quarters of postdocs were adamant that they would not, although the 1994–95 cohort was less resistant to the idea of a career in teaching.

Despite the uncertainty of a postdoc's life, the intellectual satisfaction of academic research remains a powerful pull. Nearly half the postdocs are still employed by higher education institutions. Of those, about 40 per cent have permanent faculty posts. The rest are postdocs (30 per cent), fellows (13 per cent) or have other posts (17 per cent). Half of those who are still postdocs stay in the universities because they enjoy the research. This is despite knowing they are unlikely to get a permanent faculty position and that they would be financially

Annual gross salaries of physics postdocs

Gross salary	Percentage of respondents
Up to £20,000	12
£20,000–£29,999	68
£30,000–£39,999	13
£40,000–£49,999	3
£50,000–£74,999	2
£75,000–£99,999	<1
£100,000+	<1
Not answered	1

Figures are based on responses from 436 people who started their first postdoc between 1988 and 1993. The finding that 87 per cent of survey respondents command annual salaries in excess of £20,000 can be compared with data from the 1998 New Earnings Survey (published by the Office of National Statistics) showing that only 35 per cent of workers in full-time employment command annual gross salaries in excess of £20,000.

Source: IoP.

better off in industry and could be undertaking challenging research there. The other half of postdocs still harbour hopes of a permanent post.

The survey *Career Paths of Physics Post-Doctoral Research Staff* is published by the *Institute of Physics* (email: physics@iop.org).

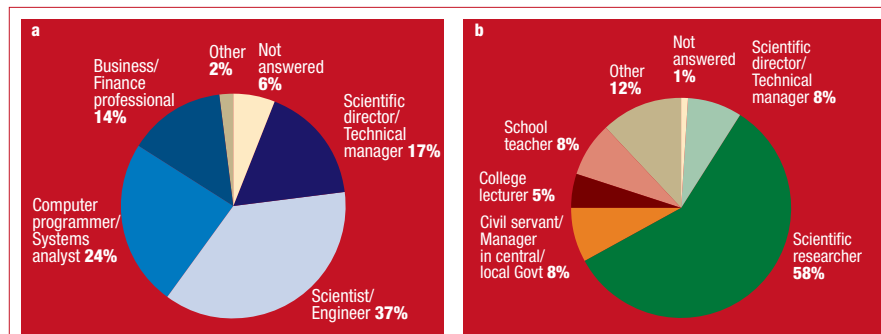
Job search

The career paths survey by the Institute of Physics (IoP) gives a good idea of the spread of business sectors in which physicists are employed. Company websites are, obviously, an important source of information about the type of people sought by these industries.

The websites of both the IoP (<http://www.iop.org>) and the American Institute of Physics (AIP; <http://www.aip.org/careers>) are professional and full of content. The AIP's site is well worth a look even if you are not job hunting in the United States. Networking, says the AIP, is very important, both at conferences and through the Internet. The IoP produces a range of booklets and multimedia packages with practical information. Titles include *Scientists in Business*, *Starting as a Consultant* and *Building Careers that Fit*. Although aimed at physicists, they contain some general advice that could help people from any discipline.

If you are interested in teaching, the government announced a £5,000 incentive in 1998. The first £2,500 is paid during teacher training and the second instalment is paid at the start of teaching. More information can be found at <http://www.go4itnow.com> and <http://www.teach-tta.org.uk>.

For further reading, see the *Nature* Careers and Recruitment feature 'Physics grapples with its image problem', available online at <http://www.nature.com/jobs> or in *Nature* 398, 265–268 (18 March 1999).



Occupations of physics postdocs: a, in the private sector; b, in the government, public and voluntary sector. (Source: IoP.)

From active research to science publishing

For a flavour of life in scientific publishing, it seemed appropriate to take a stroll around the *Nature* offices. Every journal, of course, is different, but *Nature*'s staff here give an idea of the range of editorial-related jobs available on journals and what they, as recruiters, look for.

“Do you miss active research?” That was the question I dropped into the email boxes of *Nature*'s staff, curious to know how they felt about a career away from the laboratory. The answers ranged from a resounding “no” to the more qualified “not seriously” given by Philip Campbell, *Nature*'s editor. “Occasionally, I’ve been enthused by a particular scientist’s description of a problem, and envied his or her being wrapped up in it, but then I move on,” he says.

“I love the breadth of the science [we publish],” says Rory Howlett, *Nature*'s deputy biology editor. “When you are doing active research you can become too narrow and lose touch with what you loved about science in the first place.” From the physics editors the answer was similar. “I feel more immersed in science than ever,” says Karen Southwell. There are times, though, when she misses research “a little”. How much that has to do with being an astronomer who previously visited telescopes in exotic locations is, she admits, not clear.

At a more serious level, Southwell is glad that she moved to *Nature*, because “there is

no security in academia and I never fancied being a lecturer”. As exciting and satisfying as research can be, lack of security is undoubtedly one of the downsides highlighted by *Nature*'s staff as a reason for leaving academic research. Poor pay and lack of career structure were others. Henry Gee, *Nature*'s senior science writer and the editor responsible for palaeontology, says that his superiors “were forever on the insecure, nomadic postdoc trail”. Now, says Gee, “I get all the intellectual thrill of being a scientist without any of the misery.” He is also paid a salary roughly equivalent to that of a senior lecturer.

Varied roles

The thrill comes from exposure to the cutting edge of science reported in the manuscripts submitted to *Nature*. Because papers are the heart of any scientific journal, it is jobs like Gee's, Howlett's and Southwell's as editors that spring most readily to mind when thinking of a career in scientific publishing. But graduates contemplating such a career should be aware that the responsibility and content of an editor's job varies considerably from journal to journal, and it is worth doing research on any publication you might consider working for. The job can, for example, be primarily administrative, liaising with the editorial board and peer reviewers, or it can involve basic copy-editing, proof reading and working with production.

In large part, the editor's degree of responsibility depends on whether the journal has an editorial board and how extensive and influential the board is in determining the journal's editorial content. *Nature* and her sister publications do not have editorial boards. Although peer review naturally remains the means of assessing technical quality, it is the editors, not a board, who select the reviewers and who decide on editorial grounds which paper — assuming it passes peer review — is published. This makes the role of an editor on journals in the *Nature* family somewhat different from that on many specialist journals.

Nature's editors send roughly 20 to 30 per cent of the papers received for peer review. If

get all the intellectual thrill of being a scientist without any of the misery



Henry Gee

the work is reviewed favourably, the editors might still decide on editorial grounds that it is not of sufficient interest. Then again, perhaps two reviewers say the work is good but one says it isn't. The work is not necessarily published. “It's not a democracy,” says Howlett, arguing that the two may not make as good a case for their view as the one. “We are looking for independence of mind in our editors,” says Campbell.

During 1999, *Nature* expanded the number of biology editors and looked for people with postdoc experience from good labs. “We want people who, if they were to stay in science, would have a bright future,” says Howlett. “We are not looking for refugees.” Anyone applying to be an editor on *Nature* titles (and, although they operate somewhat differently, to other top journals like *Science* or *Cell*) will need to demonstrate excellent academic qualifications, specific knowledge of their discipline and an awareness of the big themes in science. They can expect stiff competition for the job.

Day-to-day tasks

The key tasks of being, say, a biology editor at *Nature* involve taking your share of the 100 to 120 biology manuscripts that arrive in the office each week. Each editor has an area of core expertise, such as neuroscience or ecology, and two or three satellite areas. Maxine Clarke, the journal's executive editor who has responsibility for the cell biology and biophysics of ‘motor’ proteins, says, “I get a kick out of trying to attract the

I love the breadth of science [we publish]... When you are doing active research you can become too narrow and lose touch with what

you loved about science in the first place



Rory Howlett

best research in my field and in publishing the top articles.”

On average, only 10 per cent of the total papers received by *Nature* appear in print. Once accepted they go to a subeditor, whose job it is to work on the text so that the ideas are accessible, the style consistent and the figures and tables presented clearly. Unlike more specialist publications, *Nature* aims to make its scientific papers as understandable as is practicable to a general scientific audience, meaning that subeditors may have to rewrite parts of the papers into more accessible English. On another journal the subeditor's job may be done by a manuscript or desk editor.

A subeditor on *Nature* will probably, like Rachel Smyly, have a PhD or some research experience. Smyly studied natural sciences at the University of Cambridge and did a couple of years of research. “It's good to be exposed to so much exciting science,” says Smyly. “As a subeditor, my responsibility is to ensure that papers are understandable and interesting to scientists from other areas of research.”

Although not as narrowly focused as an active researcher, *Nature's* editors are quite specialized. The News and Views section, therefore, bridges the gap between hard-core manuscript publishing and the kind of science features written for a lay audience that are found in magazines like *Scientific American* or *New Scientist*. News and Views articles, written by scientists, put current research in context for readers in other fields.

Tim Lincoln, who has degrees in biology and oceanography, heads the team comprising himself, a biologist and a physicist responsible for commissioning and editing the section. When he is recruiting, Lincoln looks, obviously, for good academic qualifications. Everyone on his last short list had a first-class degree, although a good candidate with a 2(i) would not have been excluded. Given that an important part of the job is use of language, candidates are expected to be native English speakers. Strong candidates from outside the UK would be flown to



In choosing a career in scientific publishing, *Nature's* editors are exposed to the cutting edge of science.

London for interview. At interview the candidates need to show confidence, and demonstrate enthusiasm and an ability to communicate well with others, as well as a reader's knowledge of *Nature*. Without these attributes, brilliant academic qualifications are not enough. “I'm an enthusiast and I like to work with enthusiasts,” says Lincoln.

Avoiding pitfalls

What excludes a candidate? Typographical errors or poor spelling in the application letter are an automatic barrier. “The production team doesn't stand by with outstretched arms to catch us,” says Lincoln. One of the fastest ways to hit the bin is to send an application letter that sounds like a round robin or fails to demonstrate a knowledge of *Nature* (for *Nature*, substitute the title of whatever journal or employer you are seeking work with).

Sarah Tomlin, who commissions physics News and Views articles, did not make those mistakes. She has a PhD in biophysics and was one of 60 applicants. There were 260 candidates for the biology News & Views post, doubtless reflecting the subject's popularity on the eve of the so-called century of biology. Given that all of the applicants on Lincoln's short lists have good academic qualifications, the question arises as to what gives a candidate an edge. A huge plus with Tomlin's application was that she had written a science column for her student newspaper, and so demonstrated an enthusiasm for science communication. “It was hard work finding a job in the field I wanted,” says Tomlin. “These science-related communication jobs come up very rarely.”

The comment is fair warning. So here are a few tips. “Out of every 100 people who consider a career in publishing or journalism, 95 want to write. It's a rarity to come across people who want to edit,” says Lincoln. His advice, therefore, is to look for jobs in production or as a subeditor. Lincoln's career started in book production at Academic

Press. “The pay was dismal,” says Lincoln, “but in publishing you often start with unglamorous jobs, and what happens next is what you make of it.”

Remember also that unsolicited letters to publishers do sometimes get read. Poorly written ‘form’ letters are discarded immediately, says Clarke, but “if someone takes the trouble to write a good letter, I like to respond”. Both Lincoln and Stephanie Pain, now associate editor at *New Scientist*, sent letters to publishers when starting out, and several months later received letters asking them if they were still interested in a post.

In addition, consider postgraduate training in journalism, editing or production at an institution such as the London College of Printing (www.lcp.linst.ac.uk), Cardiff University (www.cf.ac.uk/uwcc/jomec/), London's City University (www.city.ac.uk/journalism) or the University of Sheffield (www.shef.ac.uk/~j/). Monitor *The Guardian* (www.jobsunlimited.com) on Mondays for jobs and courses in the media, and study the classified sections of *Nature* (www.nature.com) and *New Scientist* (www.newscientistjobs.com) regularly.

Finally, look out for jobs on specialist publications. Dennis Pilling, who is responsible for acquisitions at the British Library, says that there were 8,618 science, technology and medical serial publications deposited at the library in 1998/99. Some of these will be specialist publications aimed at, say, the building trade, electronics or computing. These publications include news and features about issues affecting their readers and, if your aim is to be a journalist rather than work on manuscripts, these publications are a good place to learn and develop the skills needed. Besides offering a good career structure, the ‘trade and techs’ can be a route to the nationals, consumer magazines or the kind of science policy reporting published in journals like *Science* and *Nature*. ■

In publishing you often start with unglamorous jobs, and what happens next is what you make of it



Tim Lincoln

Scientists in journalism

A profile of Stephanie Pain, associate editor of *New Scientist*

In 1992, the team working with data collected by NASA's Cosmic Background Explorer (COBE) satellite made headlines around the world when they announced they had found tiny fluctuations — the seeds of today's galaxies — in the cosmic microwave background radiation. Stephen Hawkins hailed the findings as the discovery of the century, while headlines such as "ripples at the edge of the Universe" fired the popular imagination.

New Scientist was not immune from the excitement. The story broke on a Friday and was the main topic of conversation that evening in the wine bar. Stephanie Pain, then the magazine's news editor, became convinced that they should discard the planned cover — something that *New Scientist* has done only rarely — and replace it with an image related to the COBE story.

At 11 pm she rang the publisher and succeeded in convincing her to make the switch. Over the weekend, they scrambled for a new cover. At the same time the magazine's astronomy consultant, Nigel Henbest, set about getting every detail of the story. On Monday morning he sat down to write 2,000 words explaining the results and their significance. "It was brilliant," says Pain. "It shows what you can do when you have people who know what they are doing."

Pain was *New Scientist*'s news editor for six years, but it was not the job she envisaged for herself either when she was an undergraduate or when studying for a PhD. "As an undergraduate I thought vaguely about being a biologist without really knowing what that was. Then when I graduated I knew I didn't want to do research or to teach."

Instead, Pain became a lexicographer. A stint as a desk editor for medical publications followed, but after two years of this she had learned all she wanted to about handling manuscripts for publication, and she began combing the advertisements for new opportunities. One of the things that Pain, like many others, says frequently is "I didn't expect to get the job". So when she spotted an opening for a research assistant in the oceanography department at Swansea University she sent off her application with

Imagine, I have a background in oceanography and have had a chance to visit the great marine laboratories like Woods Hole and Scripps — and get paid for writing about it. I can't think of anything else I'd rather do

little hope. She was particularly conscious that she was not a marine biologist.

Nevertheless, Pain was soon ensconced in Wales studying for a PhD as part of a research team investigating whether deep oceans experience seasonal variations. The question was new at the time, although the field has since moved on and firmly established that there are such variations. Pain's piece of the puzzle was to investigate whether there was a pattern to starfish reproduction that might reflect seasonal variations. "Being locked up in a ship in bad weather is good training for being on the news desk in a crisis," she says.

Three years after starting her research, Pain had written her thesis and was faced yet again with the question of how to earn a living. Until now she had been opportunistic, responding to what seemed interesting. "For the first time, I thought carefully about the future. I had colleagues in their 40s on their third or fourth postdoc. I probably could have chased funds for more research, but I could see myself at 40 without a full-time job."

Instead, she left academic research and unwittingly mounted a roller coaster. She freelanced while job hunting, then got work as a medical editor, and was made redundant after three months. She saw an advertisement for a job at *New Scientist*, applied, and then had to sit back and wait because the editors of the magazine promptly went on strike. Once again, she did not think she would get the job. Once again, she did.

Pain started as the magazine's book review editor, then became successively the science news editor, life sciences editor,



Pain relishes the opportunities her job throws up, here on expedition in the Australian bush.

deputy features editor and news editor. She is now the associate editor and is a free-roving editor writing about subjects that interest her. Research, she says, taught her to be observant and careful, traits which have helped her career.

Clearly she loves her life as a science journalist and has enjoyed her career to date, but does she miss scientific research? "Now and again," says Pain. "When I'm deep into the research for a feature and I see a problem and think I'd like to solve that. But the feeling goes when I finish the feature."

And there are compensations. For example, travelling with the Royal Geographical Society in the Australian bush and writing features about their work, spending a week at a wildlife forensic laboratory in Oregon or snorkelling on the great barrier reef. "I've been given fantastic opportunities," says Pain. "Imagine, I have a background in oceanography and have had a chance to visit the great marine laboratories like Woods Hole and Scripps — and get paid for writing about it. I can't think of anything else I'd rather do."

Scientists in journalism

A day in the working life of **Christine McGourty,**

science and technology correspondent for BBC television and radio

Christine McGourty's day begins just before 7 am when she switches on the *Today* programme to listen to the radio news. As she prepares herself for work and her children for the day, she keeps one eye on breakfast television.

On this particular day McGourty was keen to hear how her report prepared the day earlier sounded on air. The story was about signals from rats' brains powering a robot arm and was based on a scientific paper published in *Nature Neuroscience*. All of the top journals, including *Science* and *Cell*, provide material for radio and television news stories, along with electronic sources of science news such as AlphaGalileo, BioMedNet and Eureka.

All was well with the rat story. No inadvertent mistakes had been introduced during the editing. By 8 am, McGourty was talking to the television producer for the BBC's news at one, who wanted to know if the radio story could be redone for television. McGourty's answer was yes, but that left only two hours to get suitable footage and find another interviewee who could say more than had already been reported on the *Today* programme.

Frustratingly, the US researchers had footage but were reluctant to release it because of potential reprisals from animal rights activists. Shelving the problem for 20 minutes, McGourty did live interviews on the rat story with regional BBC radio stations. Then she lined up an interviewee on

The skill of the television and radio journalist lies in spotting a story and rapidly understanding and distilling complicated science into perhaps no more than 250 words



High flyer: McGourty prepares to chase August's solar eclipse.

the rat story for the news at one, and by 9.30 am was driving across London to the BBC Television Centre at White City. En route, the producer telephoned and cancelled the piece. McGourty diverted to catch a train to Bletchley to film interviews about the future of the historic Second World War code breaker's site.

While McGourty headed for Bletchley with a film crew to talk with the chief executive and record the clatter of the enigma machines, a producer was on her way to Sheffield to interview one of the code breakers. Both headed back to London in the early evening and from 7 pm onwards McGourty viewed the footage, chose clips and wrote and recorded her television script. All this was left for overnight editing. In the meantime, McGourty recorded a radio track for the early morning news and left for home at 10 pm. The next morning, the routine began again with a producer from the news at one discussing how they could use the Bletchley story that lunch time.

The skill of the television and radio journalist lies in spotting a story and rapidly understanding and distilling complicated science into perhaps no more than 250 words. The task can be particularly difficult

Christine McGourty has a BSc in Chemistry from the University of Edinburgh and a postgraduate diploma in journalism studies from Cardiff University. Before studying at Cardiff she taught English as a second language in Britain and then Italy. Her journalistic career started as an intern at *New Scientist*. She was one of *Nature's* News reporters for two years and then worked at the *Daily Telegraph* for five years, before joining the BBC in 1995. She speaks Italian and French and has a good understanding of Spanish.

for a daytime audience that is unlikely to have many science qualifications. To aid understanding and make the story lively, graphics can be commissioned and interesting interviewees need to be found.

On intense days, such as when McGourty worked on the rat and Bletchley stories, the deadlines are relentless and must be met throughout the day. Typically, the BBC's specialist correspondents work long, intense hours perhaps twice a week. On other days, the correspondents reach home earlier. "The job can be nerve wracking," says McGourty, with commendable understatement. ■

Science takes form **in theatre**

A touring theatre company is bringing science to life for young schoolchildren, and dispelling conventional views of the creativeness of your average science graduate.



Young children take joy in their first encounter with science.

Music calculated to calm the most boisterous of five years olds plays as the children file to their places. Katherine Shaw and Dan Roebuck stand in colourful costume surrounded by a few simple props, smiling as the children take their places cross-legged on the floor. One young boy asks what they are doing.

"Theatre — a play," says Shaw.

"What about?" asks the boy.

"Science," she says.

"Urgh," says he.

And with that he comprehensively dismisses the whole mighty intellectual endeavour.

But after a half-hour tour of the world from the Arctic to the Savannah grasslands of Africa, conducted through mime, laughter and audience participation, the young boy says: "That was dead good."

Shaw and Roebuck are members of the Floating Point Science Theatre formed 10 years ago by Steve Mesure. Floating Point recruits people with a science and drama background to tour the country with plays that present the science, technology and geography of the national curriculum to children aged 4 to 11 years. Mesure believes that exposure to science in an interesting way at an early age is important, an issue that an education subcommittee of the Council for Science and Technology is currently evaluating. There is evidence that between the age of 9 and 14, pupils become disillusioned with science and so do not go on to study science subjects. The Floating Point Science Theatre and others like it aim to engage young children

in science through drama.

Before forming Floating Point, Mesure studied environmental physical science at the University of Kent, and then joined industry as a geophysicist working on oil exploration in Africa. Shaw studied natural sciences at the University of Cambridge, while Roebuck's degree is in combined studies from Leicester University. Since graduating, all have followed paths that belie the stereotype of the science graduate as uncommunicative, serious and unimaginative.

At Cambridge, Shaw acted in student productions and discovered the power of drama to explore relationships and see the world from a different perspective. Following the advice of her careers adviser at Cambridge — who was initially startled by her theatrical ambitions, but then practical and supportive — Shaw learned the skills of a personal assistant after graduating so that she could raise money to study drama and

support herself between parts.

Roebuck moved from Leicester to the lucrative world of assembly language programming for telecommunications companies. "Sitting at a desk being physically immobile was very frustrating," says Roebuck. So he left and spent three years building and renovating old property, before working with Voluntary Services Overseas. When he could, Roebuck studied drama at evening classes.

Both are now on a path that is familiar to actors in the early stage of their careers, taking small parts in soap operas and touring the country with theatre groups. Both see their futures in drama, not in science. But for a few months, their science is giving a forum for their acting, or perhaps their acting is giving life to their science. ■

Further information on the Floating Point Science Theatre can be found at <http://www.floatingpoint.org>.

